TAQA North Ltd.
Well Blowout
10-10-28-29W4M
June 8, 2009

ERCB Investigation Report

January 11, 2010

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Energy Resources Conservation Board

ENERGY RESOURCES CONSERVATION BOARD
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1 Incident Overview

At about 11:25 a.m. on June 8, 2009, a contractor for TAQA North Ltd. (TAQA) experienced a loss of well control (blowout) while performing maintenance activities on a gas well containing 42 per cent hydrogen sulphide (H_2S). The well, which had been shut in during the winter due to hydrate problems, is located at Legal Subdivision 10, Section 10, Township 28, Range 29, West of the 4th Meridian, about 4 kilometres (km) southeast of the Town of Crossfield (about 0.5 km east of Highway 2).

The contractor was conducting a packer isolation test in accordance with Energy Resources Conservation Board (ERCB) requirements and evaluated the wellhead to determine the best way to obtain the necessary well and annulus pressures. The contractor noted that there was a circulation string tied into the casing on one side of the wellhead and a 1/4 inch (6.35 millimetre) hydraulic control line (see Figure 1) coming out of the casing on the other side.

The contractor made the decision to tie into the 1/4 inch control line to obtain the pressure readings. The contractor attached an existing gauge to the line downstream of a needle valve and tried to remove the gauge. It made an initial attempt to remove the gauge with various tools, but halted the effort when it observed a small amount of gas leaking from the 1/4 inch line at the point where it entered the wellhead.

The release of gas subsided after a short period of time, and the contractor initiated a discussion with TAQA personnel. After the discussion, the contractor and TAQA personnel decided to check the production casing and tubing annulus pressure on the circulating string lines and if no pressure was found, to remove the 1/4 inch control line and install a valve on the casing connection.

TAQA personnel left the site while the contractor proceeded with the work, and when it checked the circulating lines, it observed no pressures, removed the plug from the 1/4 inch control line, and installed a gauge. The contractor observed a pressure of 2200 kilopascals (kPa) and decided to remove the gauge and report the findings to TAQA personnel. While the contractor tried to remove the gauge, the leak returned and the site was evacuated.

At 11:40 a.m., the contractor notified TAQA of the second release and TAQA immediately dispatched personnel to the site.

At 12:15 p.m., TAQA activated its emergency response plan (ERP) and established its corporate regional emergency operations centre (CREOC) and incident command centre. It dispatched an air monitoring trailer to the site and made arrangements to bring well control equipment to the site.

TAQA notified the ERCB Midnapore Field Centre (MPFC) and the ERCB Emergency Response Group (ERG) of the incident.

Between 12:30 and 1:00 p.m., TAQA sent incident notifications to Rocky View County, Alberta Environment (AENV), Alberta Health Services (AHS), and the RCMP. It contacted local residents by telephone or in person, instructing the residents to shelter in place. TAQA put an evacuation centre on standby in Airdrie in case the incident required evacuating nearby residences. TAQA personnel registered H_2S readings of 6 parts per million (ppm) 10 metres (m) from the wellhead using handheld monitors.

Between 1:00 and 2:00 p.m., the ERCB dispatched its air monitoring unit (AMU) and MPFC field inspectors to the TAQA CREOC, and well control equipment arrived at the release site. Well control operations began with the pumping of methanol into the well to eliminate hydrate (ice-like lumps). TAQA dispatched personnel to establish roadblocks and continued with incident notifications to residents. TAQA notified Alberta Transportation of the incident and sent updates to the RCMP and AHS.

Between 2:00 and 3:00 p.m., the MPFC inspectors arrived at the CREOC and TAQA established roadblocks to control access to the area and arranged to reroute a school bus. An AMU contracted by TAQA and the ERCB AMU arrived and began monitoring air quality at various locations. At 2:35 p.m., TAQA's air monitoring trailer detected H_2S readings of 47 parts per billion (ppb) at the junction of Secondary Highway 72 and Highway 2. TAQA continued its well control operations with the pumping of fluid comprising 3 per cent potassium chloride and water into the well.

Between 3:00 and 4:00 p.m., TAQA maintained communication with all required provincial and local regulatory agencies and the media. TAQA contacted local residents with updates, and Rol-Land Farms Ltd. notified TAQA that it had staff in the area. TAQA and the ERCB continued air quality monitoring at various locations with both handheld units and mobile AMUs. At 3:31 p.m., TAQA detected H_2S readings of 7 ppm at the wellhead and 118 ppb 100 m west at the lease entrance.

Well control operations continued, and at 4:43 p.m. all flow from the well ceased. TAQA replaced the line that failed with a new line and valve. Once no H_2S readings were detected, TAQA and the ERCB called the incident down, and TAQA notified all affected parties that the incident was over.

On June 9, TAQA continued air monitoring while it ran a plug into the well to isolate the line and prevent pressure (or wellbore fluids) from entering. TAQA then subjected the plug to a successful 7000 kPa pressure test from surface.

The ERCB classified the incident as a level-2 emergency that occurred in a rural area. The incident received media attention, and the ERCB Communications Group issued a press release.

2 Significant Findings

2.1 TAQA Investigation

TAQA sent the failed section of tubing to Acuren Group Inc. (Acuren) for inspection and testing. Acuren concluded that the 1/4 inch control line failed in a ductile overload mode as a result of the application of excessive bending stress. Acuren said that there was no evidence to suggest that environmental cracking or corrosion played a significant role in the failure.

The well was declassified from "critical sour" on July 22, 1991. The 1/4 inch line was the hydraulic control line to a subsurface safety valve (SSSV) that had been removed by a previous licensee. This removal allowed wellbore pressure to remain on the line to the surface.

TAQA identified other factors relating to the release:

- No signage on pipes and/or valves to indicate a hazard

- Lack of hazard recognition – after the initial indication of flow, the job should have been shut down until further research was conducted to verify potential piping configurations.
- No written site-specific procedures for conducting various operations at the well (e.g., obtaining well pressures).
- No drawings of wellhead piping and configuration available for personnel to refer to.
- Inadequate orientation and information on well and downhole configuration.
- No plug put in place of the SSSV to prevent wellbore pressure and fluids from being communicated to surface via the control line.
- No TAQA supervisory personnel available to ensure that adequate procedures were followed.

2.2 ERCB Investigation

The ERCB's investigation included a review of existing regulatory documents, other investigation reports, and information captured by field staff at the time of the incident. The ERCB has fully reviewed TAQA's evaluation of the incident, including the technical explanation of the nature and circumstances of the blowout.

The ERCB is satisfied with the evaluation that the primary causes of the release were the failure of a line that was open to wellbore pressure and human error arising from a lack of oversight and supervision of maintenance crews. The experience of external personnel contracted to perform tests on the TAQA well is of concern to the ERCB. Work continued on the well without confirming what the purpose or function of the line were.

The ERCB has determined that there were no contraventions of its regulatory requirements related to the cause.

The ERCB has also determined that there were no contraventions of its regulatory requirements related to the SSSV. Since the gas well was not capable of flowing greater than 140 000 cubic metres per day, an SSSV was not required, pursuant to the *Oil and Gas Conservation Regulations*, Section 7.050, Subsection 7.

The MPFC team leader and ERCB Community and Aboriginal Relations (CAR) staff followed up with all affected residents with a letter and information package. The concern of the Chief Administrative Officer of the Town of Crossfield that the town was not notified promptly of the incident was addressed by the MPFC. The MPFC confirmed to the Chief Administrative Officer of the Town of Crossfield that TAQA's ERP states that it has to notify the Town of Crossfield if an incident has impacts within town boundaries.

The ERCB has determined that there were no contraventions of its regulatory requirements related to the ERP but identified two areas for improvement:

- TAQA must update records to include temporary and seasonal workers at local businesses.
- TAQA must conduct a post-incident open house to answer any outstanding concerns or questions from area residents.

TAQA had contacted all agencies and responsible parties that were required to be contacted (ERCB, AHS, Rocky View County, AENV, RCMP, Alberta Transportation).

TAQA maintained communication with and provided updates to all parties, both public and regulatory, throughout the incident.

TAQA had an appropriate response to the incident and used all the necessary resources for well control.

There was no significant impact on the area as a result of this event.

3 Actions Taken to Prevent Recurrence

3.1 By TAQA

TAQA committed to conducting an audit of its well sites in the Crossfield, Lone Pine Creek, and Irricana fields to determine how many others have lines and valves similar to the well involved in the incident or might have unknown lines and valves. TAQA completed the audit and identified 44 other wells in the area with a similar configuration. It completed field work to rectify problems found.

Based on the findings, TAQA will develop an action plan to either eliminate or mitigate the identified hazards through actions such as modifying wellhead lines and valves, conducting training, and establishing appropriate practices and procedures.

TAQA will meet with the ERCB to review the action plan by November 15, 2009, with implementation of the action plan required by February 1, 2010.

3.2 By the ERCB

The MPFC will continue working with TAQA on an ongoing basis and will confirm with TAQA the results of the audit of its well sites in the Crossfield, Lone Pine Creek, and Irricana fields to determine if any additional action needs to be taken.

4 ERCB-Directed Action

The ERCB directs that TAQA submit a safety alert to Enform to ensure that knowledge relating to this incident is shared with industry so that operators can take action to determine if any similar problems exist at their well locations.

5 ERCB Follow-up

- The MPFC will follow up with TAQA on the implementation of the ERCB-directed action and the identified improvements to the TAQA ERP.
- The MPFC will follow up with TAQA on the implementation of the action plan outlined in Section 3.1.
- The ERCB will post its investigation report on the ERCB Web site www.ercb.ca (Industry Zone > Industry Activity and Data > Investigation Reports).

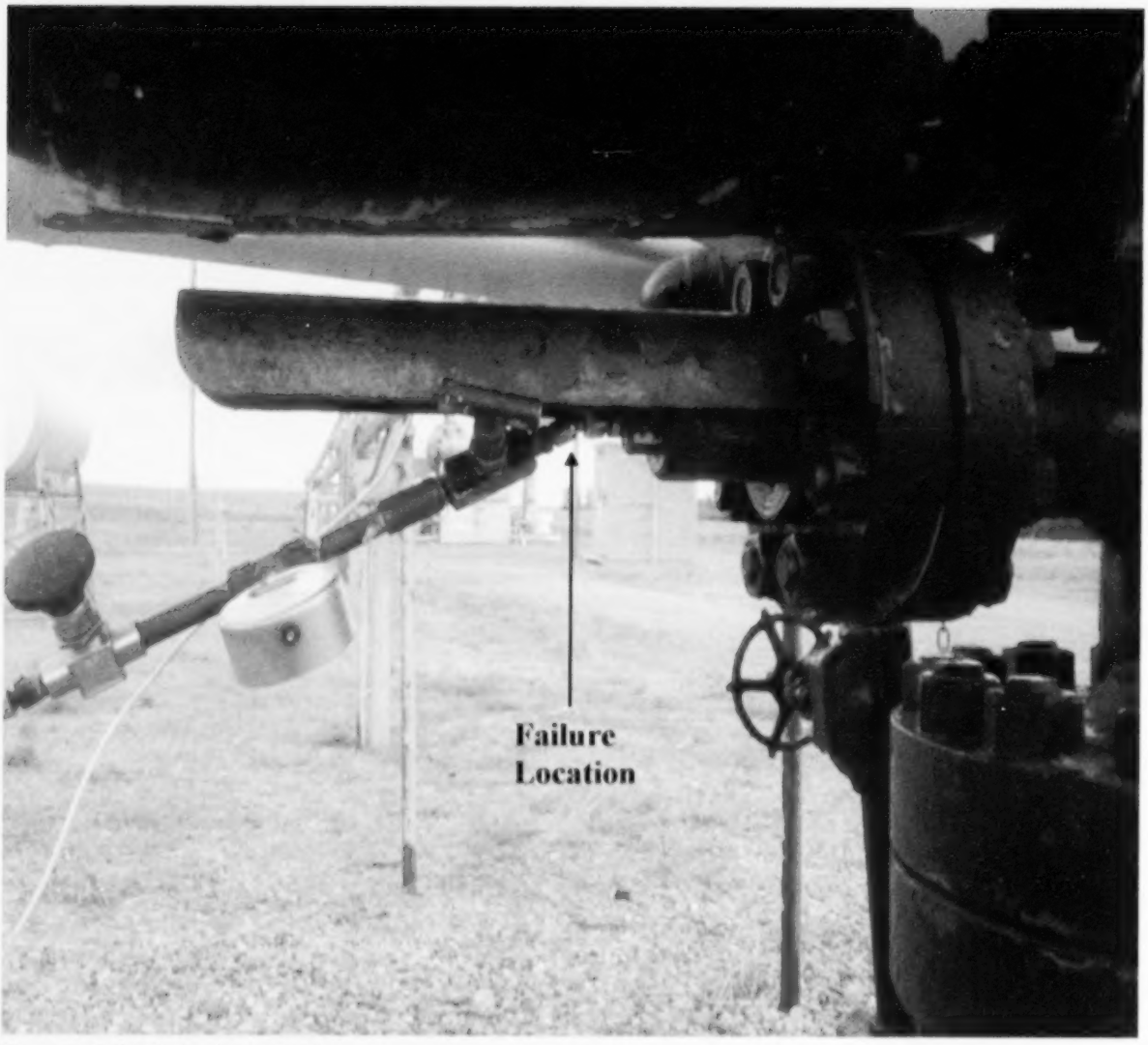

Figure 1. Failed hydraulic control line

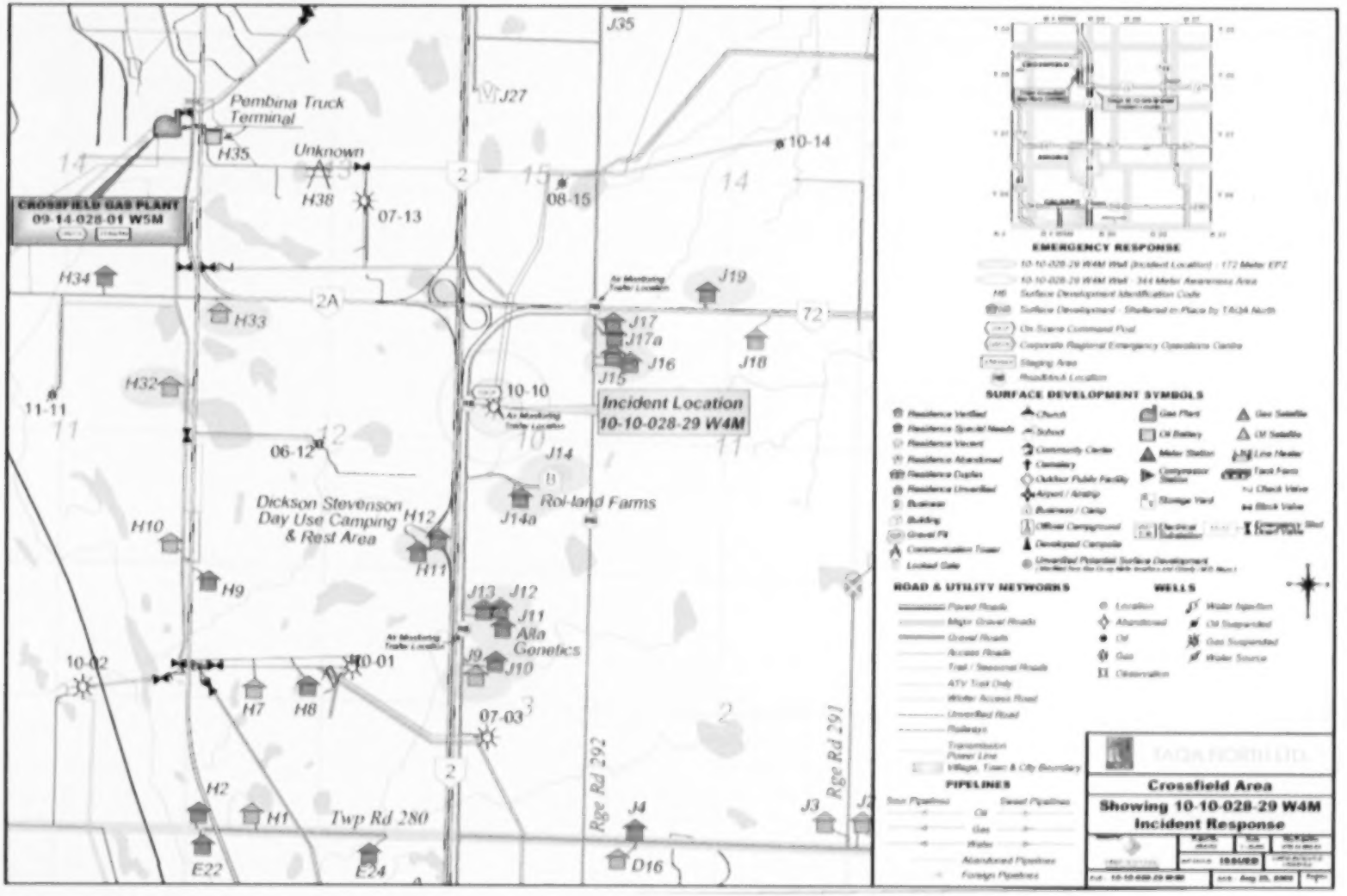

Figure 2. Area map

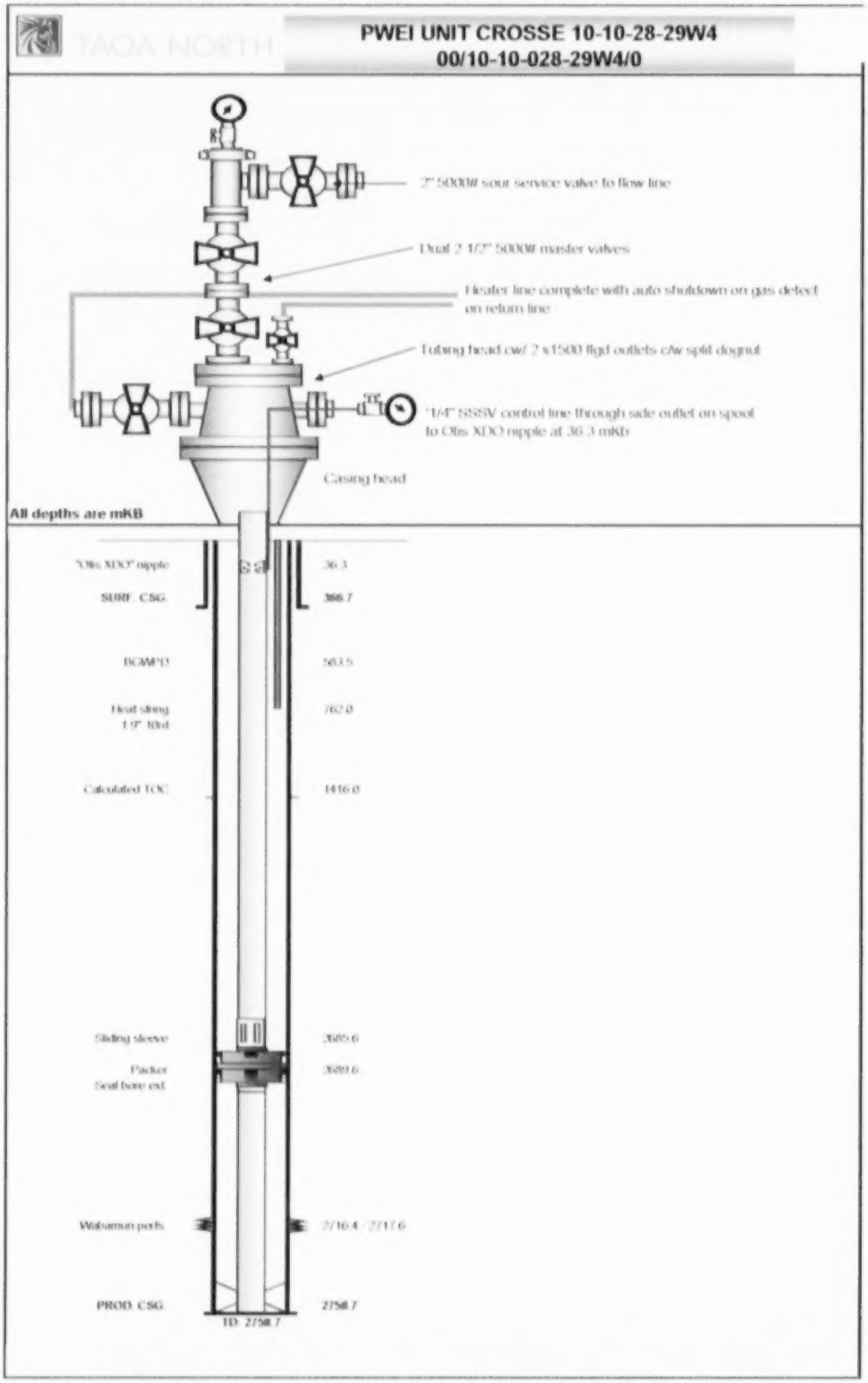

Figure 3. Wellhead diagram